Porting with OpenMP

Building Applications

To build an OpenMP application, you need to use the **`-qopenmp`** Intel compiler flag:

```
%module load comp-intel/2020.4.304
%ifort -o your_executable -qopenmp program.f
```

Running Applications

The maximum number of OpenMP threads that an application can use on a compute node depends on:

- The number of physical processor cores in the node
- Whether hyperthreading is available and enabled

With hyperthreading, the operating system views each physical core as two logical processors, and can therefore assign two threads per core. This is beneficial only when one thread does not keep the functional units in the core busy all the time and can share the resources in the core with another thread. Running in this mode may take less than twice the wall time compared to running only one thread on the core.

Hyperthreading technology is available and enabled on all Pleiades, Electra, and Aitken Intel Xeon processor types. See the following table for the maximum number of threads possible on each processor type:

Pleiades Processor Type	Maximum Threads without Hyperthreading	Maximum Threads with Hyperthreading
Sandy Bridge	16	32
Ivy Bridge	20	40
Haswell	24	48
Broadwell	28	56
Skylake	40	80
Cascade Lake	40	80

TIP: Hyperthreading does not benefit all applications. Also, some applications may show improvement with some process counts but not with others, and there may be other unforeseen issues. Therefore, before using this technology in your production run, you should test your applications with and without hyperthreading. If your application runs more than twice as slow with hyperthreading than without, do not use it.
Here is sample PBS script for running OpenMP applications on a Pleiades Ivy Bridge node without hyperthreading:

```
#PBS -lselect=1:ncpus=20:ompthreads=20:model=ivy,walltime=1:00:00

module load comp-intel/2020.4.304

cd $PBS_O_WORKDIR

./your_executable
```

Here is sample PBS script with hyperthreading:

```
#PBS -lselect=1:ncpus=20:ompthreads=40:model=ivy,walltime=1:00:00
```

```
module load comp-intel/2020.4.304

cd $PBS_O_WORKDIR

./your_executable
```

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